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ABSTRACT

A study examines the past-tense inflection process for native and non-native speakers of English. Subjects, ten native speakers of standard British English and ten proficient non-native speakers of English, were tested for responses to pseudo-irregular and -regular verbs according to their phonological distance (i.e., prototypicality) to known irregular and regular paradigms. Results indicated that both irregular and regular forms were produced using analogies. However, analysis of the data and informal interviews with some subjects revealed that when subjects failed to analogize at all, they had access to a mechanism that allowed for application of competing rules. No significant differences were found between native speakers and non-native speakers. In terms of phonological distance, rhyme effect was judged by subjects to be more crucial than alliteration effect in triggering analogies. A hybrid processing models that entailed convergence between symbolist and connectionist positions is proposed, and it is argued that such a model will necessarily embrace a conceptualization that acknowledges the dynamic interaction of analogy and rule in language processing. Contains 11 references. (Author/MSE)

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On the Processing of Regular and Irregular Inflections: The Symbolist-Connectionist Debate Revisited

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On the Processing of Regular and Irregular Inflections: The Symbolist-Connectionist Debate Revisited*

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This paper examines the past-tense inflection process for both native (NS) and proficient non-native speakers (NNS) of English. Subjects' responses to a list of pseudo-irregular and -regular verbs graded according to their phonological distance (i.e. prototypicality) to known irregular and regular paradigms were elicited. The results showed that both irregular and regular forms were produced via analogies. However, a detailed scrutiny of the data and informal interviews with some of the subjects revealed that when subjects failed to analogise at all, they had access to a mechanism which allowed for the application of competing rules. No significant difference between proficient NNS and NS was found. A further result was that in terms of phonological distance, rhyme-effect was judged by subjects to be more crucial than alliteration-effect in triggering analogies. A hybrid processing model which entailed a convergence between the symbolist and connectionist positions was then proposed. It is argued that such a model will necessarily embrace a conceptualisation which acknowledges the dynamic interaction of analogy and rule in language processing.

1. Introduction

English verbs can be inflected for pastness depending on whether the stem form is regular or irregular. Regular verbs inflect for pastness through a concatenative process whereby the regular suffix *-ed* is added at the end of the word (eg. *walk-walked, fold-folded*). Irregular verbs, however, can be inflected through various processes: vowel change (eg. *feed-fed, sing-sang, break-broke, blow-blew*), final consonant change (eg. *send-sent*), vowel and final consonant change (eg. *catch-caught*), complete change (eg. *go-went*), and no change (eg. *beat, hit, cut*).

Traditionally, the regular inflection is explained as the result of a productive and default suffixation rule while the irregular inflection is learnt by rote and stored in the lexicon. The problem with this view of irregular inflection is that it ignores the fact that irregular verbs occur in families of similar verbs (paradigms) and not as isolated entities. Further evidence against the traditional view is the apparent productivity of many irregular paradigms. This has been demonstrated in a classic study as early as 1958 by Berko in which children as young as four were able to generalise irregular forms to novel verbs. Further evidence lies in the over-generalisation of irregular paradigms to regular verbs whose similarity to an irregular pattern blocks regular affixation in children and adults (Rumelhart & McClelland, 1986; Ullman & Pinker, 1990).

Bybee & Moder (1983) extend this notion of generalisation based on similarity by describing it along a continuum of similarity. This graded analogy was demonstrated by their subjects' decreased production of irregular past-tense forms of nonsense verbs with increasing distance from prototypical irregular verbs. For example, in the production of irregular forms for the /i -->ʌ/ vowel change pattern, prototypical nonsense verbs elicited 44% irregular forms, intermediate verbs, 24%, and distant verbs, 7% (ibid., cited in Prasada & Pinker, 1993, p. 3). This graded analogical effect contradicts some theories of generative grammar (eg. Halle & Mohanan, 1985) which treat irregular patterns as rule-based (eg. "change *i* to *u*").

* I would like to thank John Williams for very helpful and insightful comments on an earlier draft, and for statistical help; and Alastair Pollitt for expert advice in interpreting my data.

The question then is whether this graded analogy effect can be demonstrated for regular verbs as well. One such attempt at demonstrating this lies in the work of connectionists, Rumelhart & McClelland (1987) (henceforth R&M). Their associative network model attempted to link a pool of input units with a pool of output units via an intervening matrix of modifiable links weighted according to phonological similarities. The result was that, although it could model people's analogising of irregular patterns to the irregular verbs it was tested on, the network failed to supply the correct regular suffix for 33% of the new regular verbs it was tested on. R&M (1986) attributed this failure to the limited training set their model underwent and argued that its errors were no more than an L1 (ie. native speaker) child's (with equivalent linguistic experience) problems with past-tense inflections.

In an attempt to resolve the 13 criticisms raised by Pinker & Prince (1988) and Lachter & Bever (1988) (henceforth L&B), MacWhinney & Leinbach (1991) (henceforth M&L) developed a simulation with an expanded training set and a new network architecture with two layers of 200 *hidden* units between the input and output units. The results of M&L's artificial neural network (ANN) model showed that at the end of the simulation, performance on the regular past tense was 100% correct. For the irregular past-tense, most of the 118 forms were correct except for 11 low-frequency forms which remained unlearned. In the testing done at the end of the simulation, 9 out of 13 *untrained* past-tense irregulars were inflected in the regular or wrong irregular pattern. This was understandable because the network had no way of knowing for sure which pattern the irregulars belonged to. But in general, the simulation performed very well; in fact, far better than R&M's model. M&L also claimed to have resolved the 13 criticisms (except one) leveled by Pinker & Prince, and L&B.

A more recent study by Prasada & Pinker (1993) (henceforth P&P) shows that irregular forms are generated via analogy, while regular forms are generated via rule, thus contradicting M&L's simulation. P&P's symbolic conceptualisation was also recently supported by Ling & Marinov's (1993) implementation of a symbolic pattern associator (SPA) model with results rivaling that of M&L's ANN model. However, there are problems associated with P&P's choice of pseudo-verbs in their elicitation task, calling the validity of their finding into question (see Tables 1 and 2 below for the list of the pseudo-verbs used by them).

Paradigm	Irregular Verb	Pseudo-Irregular Verb					
		P&P			Current Study		
		Prototype	Inter-mediate	Distant	Prototype	Inter-mediate	Distant
I --> ʌ	cling, fling, sling, slink, sting, string, swing, wring	spling, skring, sprink	fring, ning, frink	trisp, nist, blip	gling, strink	bling, pling	blik, plig
i --> e	bleed, breed, feed, lead, read, speed, plead	cleed, preed, queed	cleef, preek, queef	gleef, keeb, meep	veed, pread	geed, clead	geem, cleap
əʊ --> u	blow, know, grow, throw	cloe, froe	foa, voa	goav, joam	krow, plow	frow, shrow	frowl, shrowth
eə --> ɔ:	wear, swear, tear, bear	plare, quare	jare, grare	flape, blafe	zear, pear	jear, mear	jearp, mearp

Table 1: A Comparison of Pseudo-irregular Verbs Used in P&P and Current Study

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Paradigm	Regular Verb	Pseudo-Regular Verb					
		P&P			Current Study		
		Prototype	Inter-mediate	Distant	Prototype	Inter-mediate	Distant
I	drip, sip, flip, clip, zip, dip, grip, nip, rip, tip, whip	plip, glip, brip	brilth, glinth, plimph	frilg, krilg	frip, krip	yip, jip	yid, jiz
i	beam, cream, gleam, team, deem, scheme, scream	greem, pleem, treem	smeeb, smeeg, smeej	smeelth, smeenth, smeerg	keam, geam	feam, leam	feap, leat
əʊ	croak, choke, joke, poke, soak, smoke, stroke	gloke, proke	ploab, ploag	ploamph, ploanth	boke, zoke	doke, voke	dofe, vome
eI (P&P)	base, case, chase, face, grace, lace, place, race	slace, race	smaib, smaig	smairg, smairph			
eə (Current)	dare, scare, care, fare, pair, bare, flare				gare, vare	yare, nare	yairth, nairth

Table 2: A Comparison of Pseudo-regular Verbs Used in P&P and Current Study

In short, the problems are:

1. The use of non-existent English consonant clusters and vowel-consonant sequences. This not only produces very unnatural language but also biases subjects' responses against the use of analogy since analogy is technically impossible;

2. The use of orthographically opaque irregular verbs. This makes it virtually impossible for the production of a non-suffix form (eg. *cloe-cloo*; cf. *blow-blew*);

3. The use of inconsistent criteria for classifying the pseudo-verbs according to their phonological distance from known verbs. They are inconsistent in that:
   a. Different criteria are used for determing the pseudo-regular and -irregular verbs. For example, compare the intermediate irregular (which allow for perfect or no rhyme) and intermediate regular verbs (which don't allow for rhyme);
   b. The criteria are not tightly defined. For example, the criteria for determining an intermediate irregular allow for a choice of orthographic transparency or opaqueness, rhyme or no rhyme, partial or no alliteration; and
   c. The vowel used in the fourth paradigm is not maintained. For the irregular verbs, the vowel of the stem is /eə/, but /eI/ for the corresponding regular verbs.

In sum then, the above discussion on L1 language processing shows that the explanation of the regular-irregular distinction and the analogy-rule distinction is far from resolved. While M&L's simulation performed very well for both regular and irregular verbs, their finding is inconclusive. By explaining all past-tense inflection processes as analogy-based, they have not taken into account the fact that people can and often do fail to analogise at all. On the other hand, P&P incorporate both analogy and rule in their model; but as we have seen above, the validity of their finding is uncertain. Also, an across-the-board pairing of all regular inflections with rules and all irregular inflections with analogies is far too tidy and simplistic, considering the complexities of the competition of

regular and irregular paradigms that learners encounter in real language. Similarly, Ling & Marinov's SPA implementation is called into question since it is based on P&P's conceptualisation which may be inaccurate.

The purpose of this study is to shed further light on the above debate. The principal methodological challenge of this study is to select a list of pseudo-verbs that will reflect natural language, that will allow for a fair competition of irregular and regular forms; and that will not force an inevitable pairing of a particular verb type with only one possible inflectional process. Also research in this area so far has been confined to NS only. The current study will attempt a comparison of NS and proficient NNS. It is hoped that the resultant past-tense processing model proposed here will be able to accommodate all of the above constraints.

2. Experiment

2.1 Method

Subjects

Ten NS of Standard British English and ten proficient NNS of English from Singapore participated in this experiment. All subjects were students of the University.

Materials

The written elicitation task consists of a cloze passage containing a short story with blanks for 48 pseudo-verbs and 12 pseudo-adjectives. The story is spread over ten pages. On each page, a certain portion of the story is revealed and subjects are required to match the right verbs and adjectives with the blanks, and then write the appropriate form (whether inflected for the past or derived for the adjectival form). Adjectives have been included to further distract subjects from treating the task as a past-tense exercise.

Care has been taken to ensure a principled construction of 24 pseudo-irregular and 24 pseudo-regular verbs (see Tables 1 & 2). For the pseudo-irregular verbs, four paradigms involving vowel change have been selected: *cling-clung* (/ɪ ---> ʌ/); *bleed-bled* (/i ---> e/); *blow-blew* (/əʊ ---> u/); *wear-wore* (/eə ---> ɔ:/). The four paradigms selected here are the same as those in P&P, allowing for greater comparability of results. For the pseudo-regular verbs, the same vowels in the pseudo-irregular stems have been used. This gives subjects the choice of either inflecting the stem form in a regular or irregular way. These verbs are further divided into three classes of typicality according to two principles: (1) maintain the vowel sound and orthography for all three classes; and (2) vary the distance in terms of rhyme and alliteration between classes of verbs consistently for irregular and regular verbs. Hence the same criteria apply to both irregular and regular verbs: Prototype (with perfect rhyme, perfect/near perfect alliteration); Intermediate (perfect rhyme, no alliteration); and Distant (no rhyme, no alliteration). Vowel sound and orthography is maintained[1] to allow for both phonological and orthographic conditioning in the production of irregular forms (eg. known verb paradigm, *blow-blew*; current study, *plow-plew*; cf. P&P,

[1] Vowel sound and orthogrphy have been maintained by providing pronunciation cues, where appropriate, within the elicitation task. This stringent criteria has, however, made it extremely difficult to produce pseudo-verbs at times. For example, *pear* has to be used as a pseudo-verb. However, subjects have been briefed to treat all the words posed in the task as non-existent.

cloe-cloo). This classification criteria produces pseudo-verbs which reflect those of natural language. The problem, of course, is that a distant pseudo-verb of a particular paradigm may in fact resemble a prototypical pseudo-verb of another paradigm. This is unavoidable. In fact, it may be undesirable to do otherwise since the alternative will produce very unnatural language.

Procedure

All subjects were asked to read the short story, fill in the blanks with the appropriate form of the pseudo-words, and to rank the forms if they produced more than one form for each pesudo-word. Care was also taken to ensure that the subjects knew the pronunciation of the vowel in the stems. This was done by providing cues to the pronunciation of the vowel along the left margin. This ensured that the phonology and orthography of the vowels were maintained for all classes of verbs.

2.2 Results and Discussion

Responses were coded as *suffixed* if: (1) an *-ed* was added to the stem; (2) a *t* was added when the last consonant was voiceless; and (3) a *d* was added when the stem ended with *e*. All other responses were coded as *non-suffixed*, including no-change forms (see Table 3 for a summary of the no-change forms). Where more than one form were provided by the subject, only the first response was counted because the initial response was considered the primary form of representation of the past form. Responses with an *-ing* suffix were considered errors and not counted.

Analyses of variance (ANOVA) were performed by subjects and items. In the subjects' analysis (F1), nativeness (NT) was a between-subjects' factor, and regularity (RG) and typicality (TP) were within-subjects' factors. In the analysis by items (F2), RG and TP were between-items' factors, and NT was a within-items' factor.

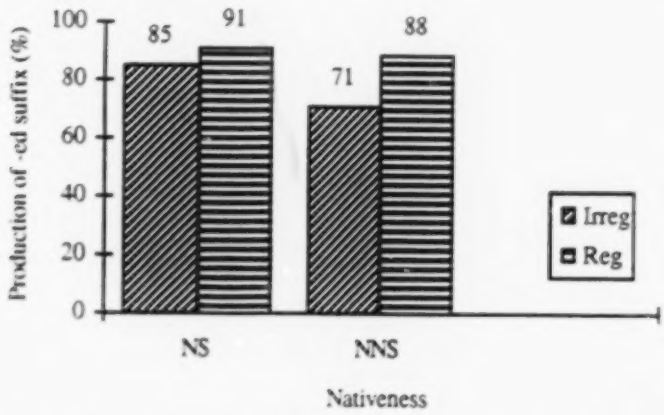

Figure 1: Treatment of Pseudo-irregular and regular Verbs by NS and NNS of English

The **overall** preference for suffixed past-tense forms even for irregular pseudo-verbs can be seen in Figure 1.

The 3-way interaction of NT, RG and TP was not significant. The interaction of RG and TP, however, was significant both in the subjects' and items' analyses [F1 (2,36) =

16.97, p< 0.01; F2 (2,42) = 8.65, p< 0.01]. Because the interaction between RG and TP was significant, there was little point in examining the main effects of RG and TP even though the main effect of RG was significant [F1 (1,18) = 11.53, p< 0.01; F2 (1,42) = 12.43, p< 0.01].

The main effect of NT, however, was worth examining because it was not qualified by a higher-order interaction.[2] It was significant only in the items' but not the subjects' analyses [F1 (1,18) = 1.31, p> 0.1; F2 (1,42) = 13.22, p< 0.01]. What this means is that given the degree of variation that exists between subjects within groups with regard to overall production of *-ed* suffixes, the difference between groups is not significant, although what difference there is is consistent over items.

For the **pseudo-irregular verbs**, the number of suffixed responses increased with increasing distance from known irregular verbs for both NS and NNS (see Figure 2), suggesting that the pseudo-irregular forms were produced via analogy with known irregular verbs. What is interesting to note here is that both NS and NNS exhibit the same pattern, ie. both use analogy.

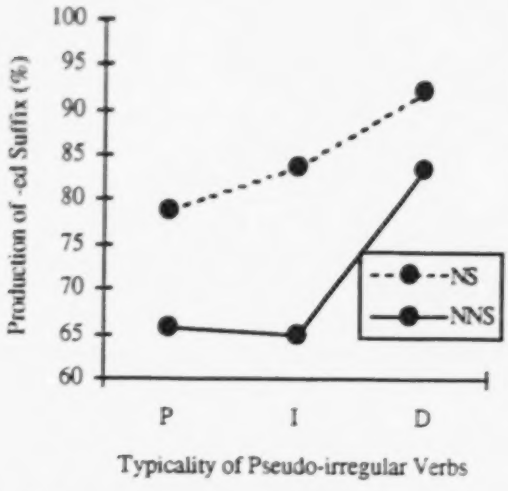

Fig 2: Production of Pseudo-irregular Verbs

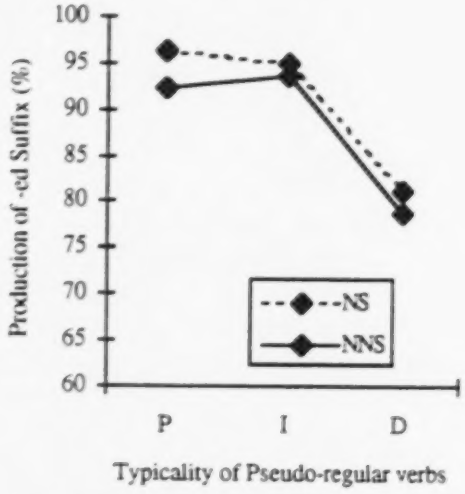

Fig 3: Production of Pseudo-regular Verbs

As the graphs show, there is no interaction between NT and TP. This makes it possible then to examine the main effects of NT and TP once again. The main effect of NT was only significant in the items' analysis [F1 (1,18) = 2.24, p> 0.1; F2 (1,21) = 12.36, p< 0.01].

The main effect of TP was significant in the subjects' analysis and marginally so in the items' analysis [F1 (2,36) = 10.30, p< 0.01; F2 (2,21) = 3.40, p= 0.0524], confirming that the differences in the production of suffixed forms for different verb classes were not due to random variation.

This result replicates P&P's (1993) and Bybee & Moder's (1983) findings that subjects

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[2] The interaction of NT and TP was not significant. The interaction of NT and RG was significant only in the items' analysis [F2 (1,42) = 4.91, p< 0.05] but this can be explained away as due to a ceiling effect. Indeed, a logistic transformation (L = log (p/100-p)) performed to get rid of the boundedness of the percentage scale showed that the difference was probably not significant. On the other hand, it could be argued that there is no ceiling effect since it is technically possible for the percentages to approach 100 since we are not dealing with reaction time. In any case, the interaction was not significant in the subjects' analysis.

are more likely to produce non-suffixed forms for novel irregular verbs similar to known irregular verbs. This supports a mechanism used by the subjects that generalises irregular inflections on the basis of analogies to existing irregular forms. This is particularly true for the prototypical (P) and intermediate (I) classes. The relative flatness of the graphs between the P and I classes suggests that rhyme is more crucial in analogising than alliteration (recall that P entails (+rhyme, +alliteration), I (+ rhyme, -alliteration), and D (-rhyme, -alliteration)).

The failure of the irregular distant (D) class verbs to invoke as many non-suffixed analogies may result in one of the following: (1) the regular *-ed* suffixation rule may be applied by default; and/or (2) regular analogies may be invoked instead. Option (1) will probably appeal more to P&P's symbolic/classical model while option (2) will probably appeal to M&L's connectionist model. However, the mutually exclusive dichotomy may be forced since technically speaking, there are no reasons why *both* options cannot be appealed to simultaneously by people. In fact, informal interviews with my subjects suggest that sometimes subjects take the rule-based route and at other times the analogy-based route for the same verb. The question then is what tips the scales in favour of one option in a particular encounter for a particular subject. What is clear though is that if a model of past-tense processing is to accurately reflect actual human linguistic behaviour, it has to accommodate the above observations.

For the **pseudo-regular verbs**, the number of suffixed forms decreased with increasing distance from known regular verbs for both NS and NNS (see Figure 3 above). This shows the effect of analogy of regular known verbs in the production of the *-ed* suffix.

Since there was no interaction of NT and TP, it was sensible to examine the main effects of NT and TP. The main effect of NT was not significant in both the subjects and items' analyses. What this means is that there is no difference in the way NS and NNS analogise. This corresponds with the narrow gap between the graphs.

The main effect of TP was significant in both the subjects' and items' analyses [F1 $(2,36) = 13.18$, $p < 0.01$; F2 $(2,21) = 7.21$, $p < 0.01$]. This result contradicts P&P's (1993) finding that similarity of novel forms to familiar regular verbs does not affect the subjects' decisions in the production of the regular suffixed forms. The current study shows that subjects are less likely to analogise regular suffixed forms with distance from known regular verbs. This suggests again a mechanism that generalises regular inflections on the basis of analogies to existing forms. Once again, the relative flatness of the graphs between the P and I classes suggests that rhyme is more crucial in analogising than alliteration.

The question then is what do subjects do when the regular D class verbs fail to analogise with known regular verbs. Subjects may be faced with the following options: (1) analogise with known irregular verbs and produce a non-suffixed form; (2) produce a no-change form when the pseudo-verb fails to analogise at all; or (3) produce a non-suffixed form by a default rule. The third option is the least likely. Options (1) and (2) are both viable; but what is interesting is what motivates (2). A quick analysis of the no-change forms produces Table 3 (see below).

The percentages in Table 3 show that the no-change form is appealed to quite frequently when an irregular suffix is preferred and this is especially so for the pseudo-regulars. To account for the preference, we need to look at the pseudo-verbs that are most likely to produce them. For both NS and NNS, the following verbs were most likely to produce no-change forms: (1) verbs ending with *d* (eg. *veed, clead, yid*), (2) one verb ending with *t* (*leat*), and (3) two verbs ending with *th* (*yairth, nairth*). Some possible

explanations are: *yid* and *leat* are produced probably via analogy with *hid* and *beat; veed* and *clead* may be produced via some vague and subconscious rule that leave verbs that look as though they have already been inflected for pastness alone; *yairth* and *nairth* may be due to a failure to analogise totally, leaving the subjects at a total loss as to what to do. The above reasons are all possible explanations and there are probably others as well. What the above discussion points to is the need to move away from a simple single-route connectionist model of explaining past-tense inflections. The above also suggests that inflexible and strict pairings of irregular-analogy and regular-rule in P&P's dual-route model are untenable. Hence, a new model which allows for both irregular and regular forms to be produced by both processes of rule and analogy needs to be developed.

	Pseudo-irregulars	Pseudo-regulars
NS	45	68
NNS	26	97

Table 3: Production of No-change Forms as a Percentage of Non-suffixed forms (%)

3. Proposed Model

According to P&P, M&L's analogy-only model is actually a reinvented counterpart to modular connectionist architectures where "left-adjusted features appear to be designed to do the work of lexical entries; right-justified features, phonological representations; identity bypass route, regular rule and rule-like components of irregular mappings" (P&P, p. 43). Furthermore, M&L's model incorporates semantic features to the input vector which is "a crude way of approximating the effects on inflection of a word's morphological structure" (p. 43). In other words, although M&L advocate an analogy-only connectionist framework, they actually incorporate an eclectic array of rote-, analogy- and rule-like components in their implementation.

P&P are right in pointing out this discrepancy between an *analogy-only* eliminative connectionist conceptualisation and a modular connectionist implementation in M&L's study. But I believe P&P err also in their conceptualisation of irregulars (via analogy only) and regular (via rule only) while ignoring the psychological reality that *frow-frowed* may well be produced via analogy with *flow-flowed* and not by a default rule. In fact, Ling & Marinov's successful dual-route SPA implementation of P&P's conceptualisation included additional ad hoc mechanisms which used "the construction of compression strategies to reduce low-level rules" and "then post-compiled [them] into higher-level generalisations" (MacWhinney, 1993, p. 295). According to MacWhinney, this move from massive parallelism and low-level generalisation to higher-level generalisations makes Ling & Marinov's symbolic implementation "look more and more like connectionists network" (p. 295). He further observes that "this convergence [ie. of the connectionist's and symbolist's implementations] between supposedly exclusive and antithetical systems" will radically change the nature of the larger symbolist-connectionist debate in cognitive science, and that this change augments well for the development of cognitive science.

The dual-route model proposed below (see Figure 4 for the model, and explanatory notes) attempts to capture this convergence by incorporating a mechanism which generalises *both* irregular and regular forms via *both* rule and analogy, thus accommodating

many of the intricacies discussed above. It is a tentative model and certainly subject to revision in the light of further empirical studies.

4. Conclusion

In conclusion, the findings of the current study show that for both irregular and regular verbs, a mechanism that generalises them on the basis of analogies to existing verbs is used. This mechanism holds true for both NS and proficient NNS of English. However, the findings do *not* exclude the possibility of use of rules either. What is uncertain is the relative proportion of irregular and regular forms produced via rules and analogies. The resultant model proposed in this study accommodates these findings.

The larger issue at stake here is how the above findings should affect the nature of the symbolist-connectionist debate of language learning/processing and cognition. The findings of the current study hint that the discussion of the symbolist and connectionist positions as mutually exclusive is counter-productive. The successes of both Ling & Marinov's SPA and M&L's ANN implementations suggest that there is probably truth in both symbolists' conceptualisation of cognition as symbolic representations and connectionists' conceptualisation of cognition as pattern association and pattern recognition. In fact, MacWhinney (1993) observes that there may indeed be a convergence between the two. The next stage of the debate could perhaps centre on a critical evaluation of the reasons for the success of SPA's and ANN's architecture and mechanism. A hybrid mechanism may well produce a 100% match with adult performance on known and novel verbs. Such a hybrid implementation will necessarily embrace a conceptualisation which acknowledges the dynamic interaction of rote, analogy and rule in language learning/processing and cognition.

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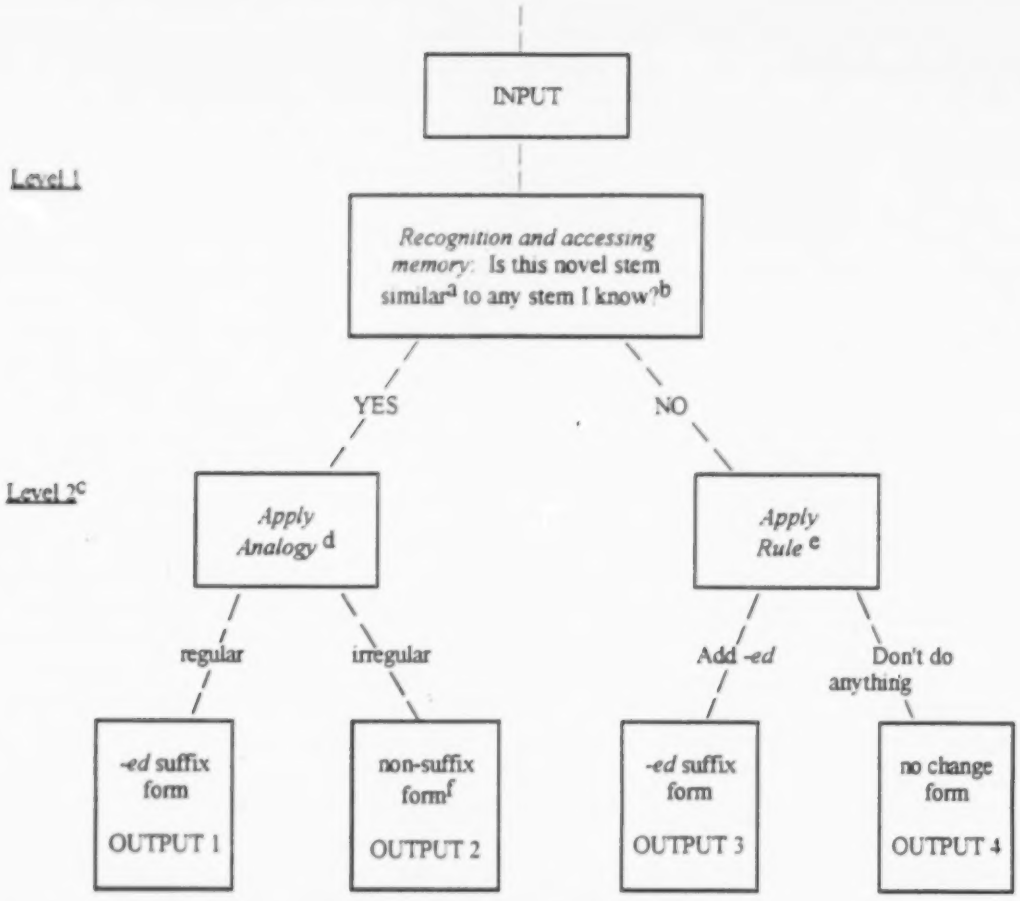

Figure 4: A Two-Level Model of Past-tense Inflection Processing

Notes:

a. The criteria adopted in similarity judgment in this study is based on phonological and orthographic distance in terms of rhyme and alliteration. P&P's criteria is phonological but not consistently applied. M&L's criteria is phonological; their production phase involves left-justified copying.

b. This is a general level involving word recognition and accessing of memory. If the novel stem looks similar, the mechanism of analogy will take place. If the stem is unfamiliar, this results in the failure to analogise. This forces an alternative mechanism that appeals to some clearly defined or subconscious rule. *(Competition of analogy-based and rule-based routes)*

c. It is arguable if Level 2 is indeed separable from Level 1 since the two cannot be distinguished in real processing time. The separation, however, is helpful in distinguishing the two stages of word recognition and word production.

d. At this juncture, subjects have to decide whether an irregular or regular analogy best matches the novel stem. This decision appears to be based on whatever analogy is salient at the time of completing the elicitation task or processing a new verb. Note that there is one regular paradigm but several competing irregular paradigms. *(Competition of different analogies)*

e. *(Competition of different rules).* It is debatable if the no-change form here is produced via a rule. Informal interviews with subjects produce the reason "It just feels right", suggesting the application of a subconscious rule. If the subjects' reason is not to be believed, the no-change form may be an attitude of "It's better to write something than nothing in the blanks". It is not clear why they didn't simply add *-ed* to resolve the problem even though they knew that the context of the task demanded a past-tense form. This issue needs further investigation.

f. OUTPUT 2 includes no-change forms and other irregular forms.